

## CLAIMS

What is claimed is:

1. A fiber optic apparatus comprising:  
a plurality of optical fibers, each optical fiber having a first end and a second end,  
said plurality of fibers being fused together along a section of each optical  
fiber proximate the first end of each optical fiber to form a fused section  
having a fiber axis, the fused section of the plurality of optical fibers being  
tapered to form a tapered region; and  
a facet, said facet being formed by cleaving or cut and polishing said tapered region  
in a direction perpendicular to said fiber axis.
2. The apparatus of claim 1, wherein the plurality of optical fibers are arranged in an  
array, the array being selected from a member of the group consisting of hexagonal  
close packed arrays, square close packed arrays, and three-nearest neighbor packed  
arrays.
3. The apparatus of claim 1, wherein the plurality of optical fibers is provided in a glass  
matrix.
4. The apparatus of claim 1, wherein each optical fiber has a core diameter, the core  
diameter of each optical fiber in the tapered region being smaller than the core  
diameter of each optical fiber in a non-tapered region.
5. The apparatus of claim 1, wherein each optical fiber is adapted to receive an optical  
input from a plurality of optical inputs at the second end, and wherein the plurality of  
optical inputs are emitted into free space at the facet as a single combined optical  
output.

6. The apparatus of claim 1, wherein the facet is adapted to receive a single optical input travelling in free space, the single optical input being distributed amongst each optical fiber in the plurality of optical fibers.
7. The apparatus of claim 3, wherein the glass matrix is comprised of fluorosilicate.
8. The apparatus of claim 5, wherein the optical input has a diameter, and wherein the diameter of the optical input at the first end of a given optical fiber is larger than the diameter of the same optical input at the second end of the given optical fiber.
9. The apparatus of claim 1, wherein the plurality of optical fibers disposed in the fused section are uniformly stretched to provide a desired amount of optical coupling between each optical fiber.
10. The apparatus of claim 1, wherein at least one optical fiber of the plurality of optical fibers has a different core size and/or refractive index from at least one other optical fiber of the plurality of optical fibers.
11. A method for coupling light comprising:
  - providing a plurality of optical fibers, each optical fiber having a first end, a second end, and a central core extending between the first and second end;
  - fusing the optical fibers together along a section of each optical fiber proximate the first end to form a fused section;
  - tapering the fused section of the optical fibers such that a core diameter of each optical fiber proximate the first end is smaller than the core diameter proximate the second end;
  - forming a facet by cleaving or cutting and polishing said fused section in a direction perpendicular to the core; and
  - illuminating the facet with the light.

12. The method of claim 11, further comprising the steps of:  
arranging the plurality of optical fibers in an array; and  
disposing the plurality of optical fibers in a glass matrix.
13. The method of claim 11, wherein the array is selected from a member of the group consisting of hexagonal close packed arrays, square close packed arrays, and three-nearest neighbor packed arrays.
14. The method of claim 11, wherein the step of illuminating further comprises the steps of:  
providing an optical input at the second end of each optical fiber; and  
emitting the optical inputs as a single combined optical output at the facet into free space.
15. The method of claim 11, wherein the step of illuminating further comprises the steps of:  
illuminating the facet with a single optical input traveling in free space; and  
distributing the single optical input amongst each optical fiber in the plurality of optical fibers to provide a plurality of distributed optical outputs.
16. The method of claim 12, wherein the glass matrix comprises fluorosilicate.
17. The method of claim 14, wherein the optical input has diameter, and wherein the diameter of the optical input at the first end of a given optical fiber is larger than the diameter of the same optical input at the second end of the given optical fiber.
18. The method of claim 11, wherein tapering the fused section comprises uniformly stretching the plurality of optical fibers to provide a desired amount of optical coupling between each optical fiber.

19. The method of claim 11, wherein at least one optical fiber of the plurality of optical fibers has a different core size and/or refractive index from at least one other optical fiber of the plurality of optical fibers.
20. An apparatus for coupling light comprising:
  - a plurality of optical fibers, each optical fiber having a first end and a second end, said plurality of fibers being fused together along a section of each optical fiber proximate the first end of each optical fiber to form a fused section having a fiber axis, the fused section of the plurality of optical fibers being tapered to form a tapered region; and
  - a facet, said facet being formed by cleaving or cutting and polishing the tapered region in a direction perpendicular to said fiber axis, wherein each optical fiber receives an optical input at the second end, and wherein the optical inputs are emitted from the facet into free space as a single combined optical output, and wherein the optical input has a diameter, and wherein the diameter of the optical input at the first end of a given optical fiber is larger than the diameter of the same optical input at the second end of the given optical fiber.
21. The apparatus of claim 20, wherein the plurality of optical fibers are arranged in an array, the array being selected from a member of the group consisting of hexagonal close packed arrays, square close packed arrays, and three-nearest neighbor packed arrays.
22. The apparatus of claim 20, wherein the plurality of optical fibers are provided in a glass matrix.
23. The apparatus of claim 20, wherein each optical fiber has a core diameter, the core diameter of each optical fiber in the tapered region being smaller than the core diameter of each optical fiber in a non-tapered region.

24. The apparatus of claim 22, wherein the glass matrix is comprised of fluorosilicate.
25. The apparatus of claim 20, where the plurality of optical fibers in the fused section are uniformly stretched to provide a desired amount of optical coupling between each optical fiber.
26. The apparatus of claim 20, wherein at least one optical fiber of the plurality of optical fibers has a different core size and/or refractive index from at least one other optical fiber of the plurality of optical fibers.